

IC-22U

IC-24

144MHz FM TRANSCEIVER

INSTRUCTION MANUAL

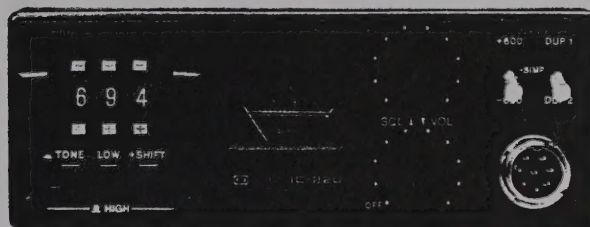


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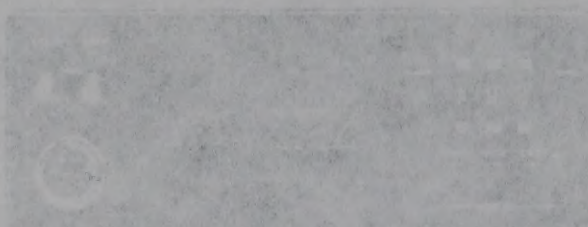


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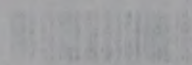


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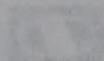


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SECTION I SPECIFICATIONS

GENERAL

Numbers of semi-conductors	Transistor	33 (IC-24G: 34)
	FET	6
	IC	10 (IC-24G: 12)
	Diode	42 (IC-24G: 44)
Frequency coverage	IC-22U	144.000 ~ 147.995MHz
	IC-24E	144.000 ~ 145.995MHz
	IC-24G	144.000 ~ 145.9875MHz
Frequency resolution	10KHz steps (IC-24G: 25KHz steps)	
	+5KHz shifts with SHIFT switch depressed (IC-24G: +12.5KHz shifts)	
Frequency Control	Thumbwheel switched digital PLL synthesizer	
Usable conditions	Temperature: $-10^{\circ}\text{C} \sim 60^{\circ}\text{C}$ ($14^{\circ}\text{F} \sim 140^{\circ}\text{F}$)	
	Operationable time: continuous	
Frequency stability	Within $\pm 1.5\text{KHz}$	
Antenna impedance	50 ohms unbalanced	
Power supply requirement	13.8V DC $\pm 15\%$ (negative ground) 2.5A Max.	
Current drain	Transmitting	
	HIGH (10W)	Approx. 2.3A
	LOW (1W)	Approx. 0.9A
	Receiving	
	At max audio output	Approx. 0.5A
Dimensions	156mm (W) x 58mm (H) x 218mm (D)	
	Weight: Approx. 1.7kg	

TRANSMITTER

Output power	: 10W (HIGH), 1W (LOW)
Emission mode	: 16F_3
Modulation system	: Variable reactance frequency modulation
Max. frequency deviation	: $\pm 5\text{KHz}$
Spurious emission	: More than 60dB below carrier
Microphone	: 1.3K ohm dynamic microphone with built-in preamplifier and push-to-talk switch
Operating mode	: Simplex, Duplex ($\pm 600\text{KHz}$ from receive frequency)
Tone Burst	: 1750Hz $\pm 0.1\text{Hz}$ (IC-22U: Not installed)

RECEIVER

Receiving system	: Double-conversion superheterodyne
Modulation acceptance	: 16F_3
Intermediate frequency	1st: 16.9MHz
	2nd: 455KHz
Sensitivity	More than 30dB S+N+D/N+D at $1\mu\text{V}$
	Less than $0.6\mu\text{V}$ for 20dB Noise quieting
Squelch sensitivity	: Less than $0.4\mu\text{V}$
Spurious response rejection ratio	: More than 60dB
Selectivity	More than $\pm 7.5\text{KHz}$ at -6dB point
	Less than $\pm 15\text{KHz}$ at -60dB point
Audio output power	: More than 1.5W at 10% distortion
Audio output impedance	: 8 ohms

SECTION II DESCRIPTION

This transceiver is a thumbwheel switched PLL synthesizer transceiver and is extremely rugged and completely solid state. State of the art devices such as Integrated Circuits, Field Effect Transistors, etc., and advanced PLL (Phase-Locked-Loop) technology are engineered into a tight-knit straightforward electronic design throughout both transmitter and receiver. Reliability, low current demand, excellent performance and ease of operation are the net result.

The RF amplifier and first mixer circuits using MOS FET's, and high-Q helical cavity resonators provide excellent Cross Modulation and Two-Signal Selectivity characteristics. The IC-22U/24E/24G has excellent sensitivity demanded especially for mobile operation, PLL controlled first and crystal controlled second local oscillators produce excellent stability, and with Crystal and Ceramic Filters having high shape factors, exceptional selectivity.

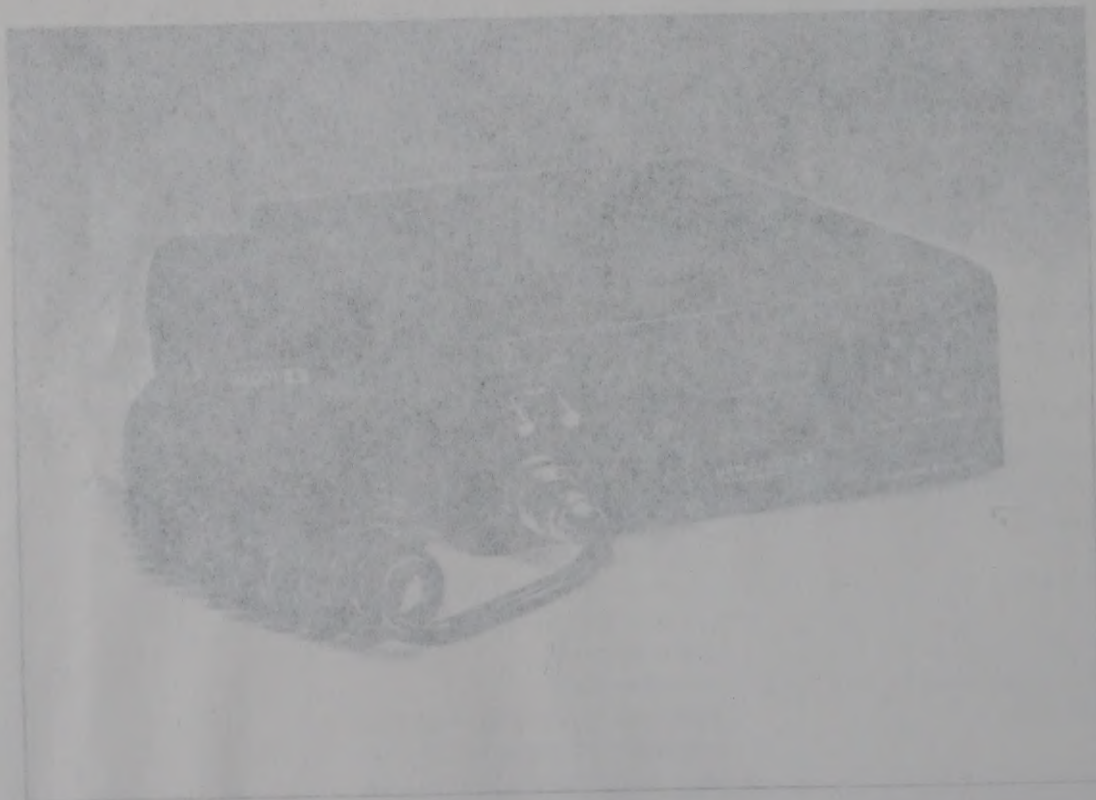
The transmitter section will produce a minimum of 10 Watts RF output. Again, a Phase-Locked-Loop is employed for initial frequency stability. 800 channels (IC-24E: 400, IC-24G: 160 channels) and various Duplex capabilities are provided for operating convenience and versatility. High-Q stages provide minimum interstage spurious emission. A low-pass filter is placed at the output to further insure undesirable frequency products not being emitted. Final PA transistor protection circuit is incorporated in the final circuitry. A new design heatsink is employed to increase final amplifier reliability.



This transmitter is a broadband switched PLL synthesizer transmitter and is extremely rugged and completely solid state. Some of the art devices such as Integrated Circuit Field Effect Transistors, etc., and advanced PLL (Phase-Locked-Loop) technology are engineered into a tight-knit, ruggedized electronic design throughout both transmitter and receiver. Reliability, low current demand, excellent performance and ease of operation are the result.

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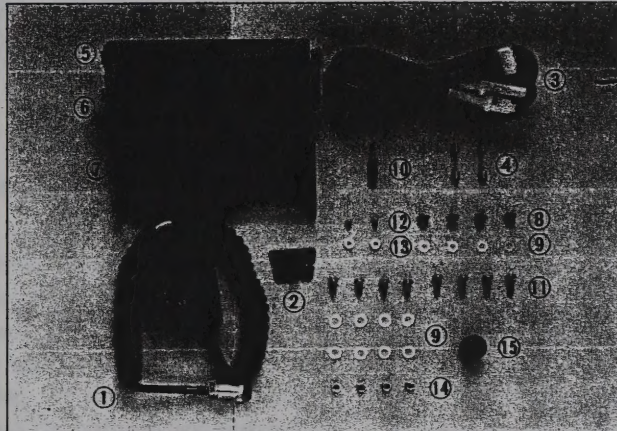
The transmitter section will produce a minimum of 10 Watts RF output. Again, a Phase-Locked-Loop is employed for initial frequency stability. 800 channels (IC 34E:400, IC 34G: 160 channels) and various Duplex capabilities are provided for operating convenience and versatility. High-Q stages provide minimum interstage spurious emission. A low-pass filter is placed at the output to further insure undesirable frequency products not being emitted. Final PA transistor protection circuit is incorporated in the final circuit. A new design heatsink is employed to increase final amplifier reliability.



SECTION III INSTALLATION

UNPACKING

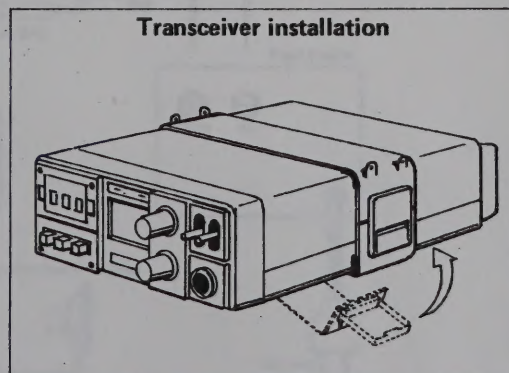
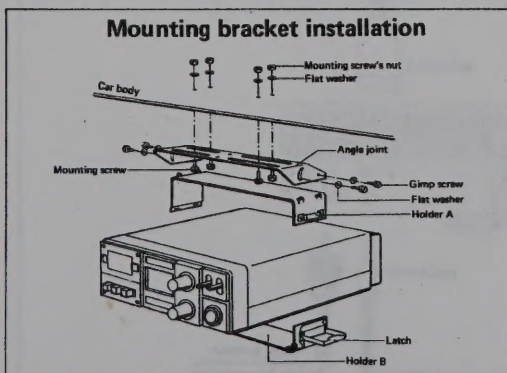
Carefully remove your transceiver from the packing carton and examine it for signs of shipping damage. Should any be apparent, notify the delivering carrier or dealer immediately, stating the full extent of the damage. It is recommended you keep the shipping cartons. In the event storage, moving, or reshipment becomes necessary, they come in handy. Accessory hardware, cables, etc., are packed with the transceiver. Make sure you have not overlooked anything.

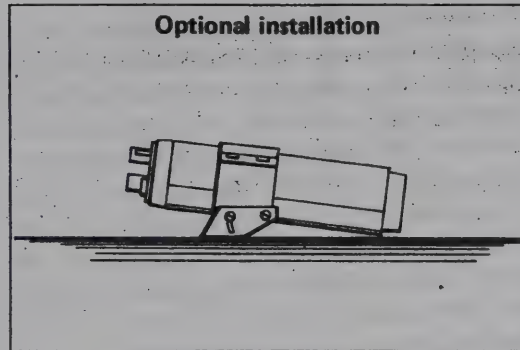
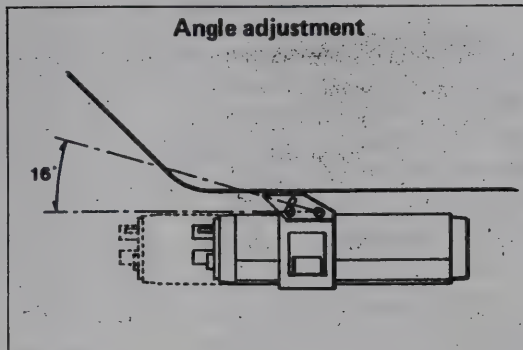


1. Microphone (dynamic type)	1	9. Flat washers	12
2. Microphone hook	1	10. Plug for speaker	1
3. Power cord.	1	11. Mounting screws	8
4. Spare fuses (5A)	2	12. Screws for additional bracket.	2
5. Installing holder A.	1	13. Flat head screw's nuts	2
6. Installing holder B.	1	14. Mounting screw's nuts	4
7. Installing angle joint.	1	15. 9 Pin MT plug.	1
8. Gimp screws.	4		

LOCATION

Where you place the transceiver in your automobile is not critical and should be governed by convenience and accessibility. Since the unit is so compact, many mobile possibilities present themselves. In general, the mobile mounting bracket will provide you with some guide as to placement. Any place where it can be mounted with metal screws, bolts, or pop-rivets will work. For fixed station use, a power supply should be designed to produce 3 amps for the transceiver.

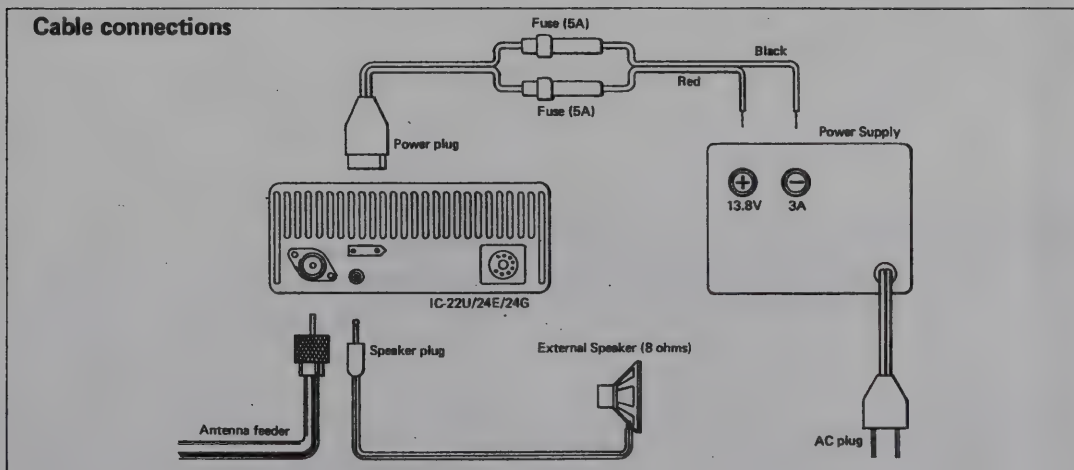




POWER REQUIREMENTS

The transceiver is supplied ready to operate from any regulated 13.8V DC, 3 ampere negative ground source. An automobile 12 volt, negative ground, system is usually more than adequate. Some note must be taken, however, of the condition of the vehicle's electrical system. Items such as low battery, worn generator/alternator, poor voltage regulator, etc., will impair operation of your transceiver as well as the vehicle. High noise generation or low voltage delivery can be traced to these deficiencies. If an AC power supply is used with your transceiver, make certain it is adequately regulated for both voltage and current. Low voltage while under load will not produce satisfactory results from your transceiver. Receiver gain and transmitter output will be greatly impaired. Caution against catastrophic failure of the power supply should be observed.

Included with your transceiver is a DC power cable with plug attached. The Red Wire is positive (+), the Black, negative (-). If your mobile installation permits, it is best to connect these directly to the battery terminals. This arrangement eliminates random noise and transient spikes sometimes found springing from automotive accessory wiring. If such an arrangement is not possible, then any convenient B+ lead in the interior of the vehicle and the negative frame can be utilized. Remember, the unit operates on a negative ground system only; it cannot be used in a positive ground automobile. After making your connections, simply insert the plug into your transceiver.



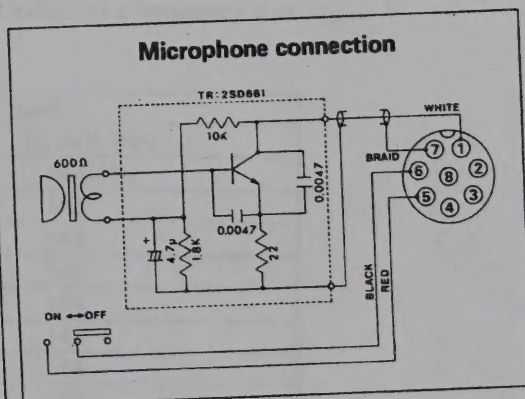
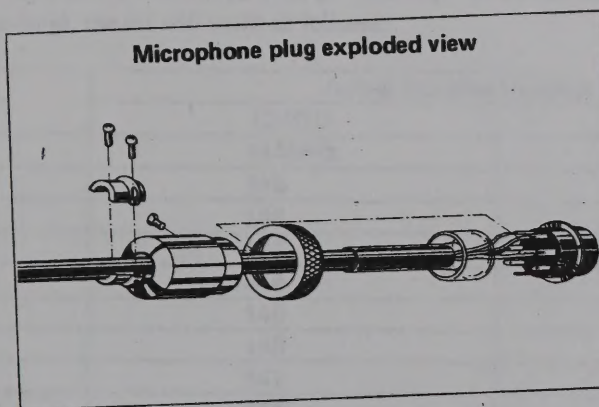
ANTENNA

The most important single item that will influence the performance of any communication system is the antenna. For that reason, a good, high-quality, gain antenna of 50 ohms impedance is recommended, fixed or mobile. In VHF as well as the low bands, every watt of ERP makes some difference. Therefore, 10 watts average output plus 3dB of gain antenna equals 20 watts ERP, presuming low VSWR of course. The few more dollars invested in a gain type antenna is well worth it. When adjusting your antenna, whether mobile or fixed, by all means follow the manufacturer's instructions. There are some pitfalls to be aware of. For example, do not attempt to adjust an antenna for lowest VSWR when using a diode VSWR meter not engineered for VHF applications. Such readings will invariably have an error of 40% or more. Instead, use an in line watt meter similar to the Drake WV-4, Bird Model 43 or Sierra Model 164B with VHF cartridge. Further, when adjusting a mobile antenna, do so with the motor running preferably above normal idling speed. This will insure proper voltage level to the transceiver.

The RF coaxial connector on the rear chassis mates with a standard PL-259 connector. Some models may have metric threads. In any event, the RF connector will mate with almost any PL-259 connector if care is taken to seat them properly.

MICROPHONE

A high quality dynamic microphone with built-in preamplifier is supplied with your transceiver. Merely plug it into the proper receptacle on the front panel. Should you wish to use a different microphone, make certain it has a proper preamplifier. Particular care should be exercised in wiring also, as the internal electric switching system is dependent upon it. See the schematic for the proper hook up.

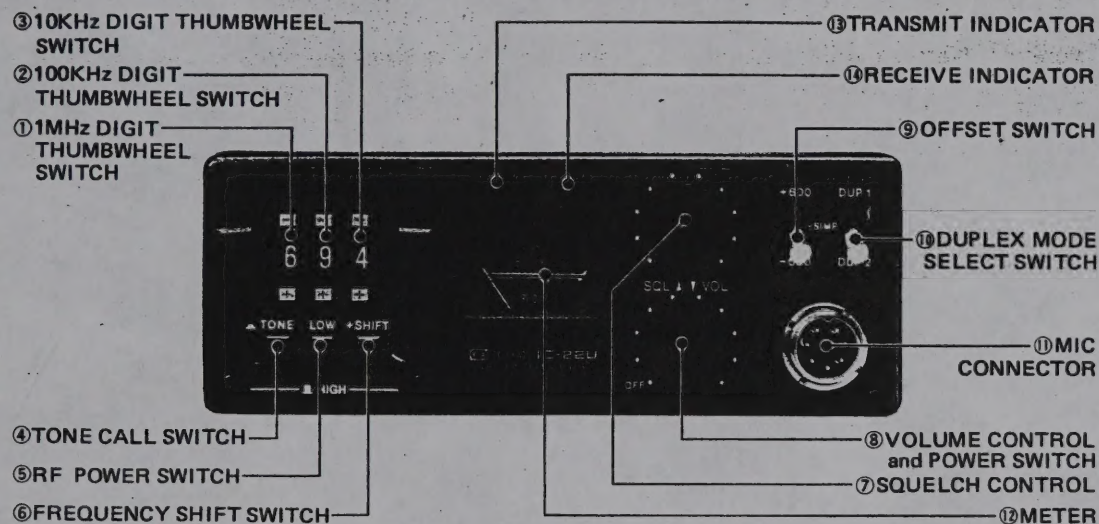


EXTERNAL SPEAKER

An external speaker jack and plug is supplied with your unit in the event another speaker is desirable. The external speaker impedance should be 8 ohms, and when used, will disable the internal speaker. An 8 ohm headset can be utilized as well.

SECTION IV CONTROL FUNCTIONS

FRONT PANEL



1. 1MHz THUMBWHEEL SWITCH

Sets 1MHz digit of the desired operating frequency. When you set a digit of a frequency that is out of the band, the set will work as follows:

Digit	Actual Working frequency band	
	IC-22U	IC-24E/24G
0	144MHz	144MHz
1	145	145
2	146	144
3	147	145
4	144	144
5	145	145
6	146	144
7	147	145
8	144	144
9	145	145

Push the \oplus button to increase the digit, and the \ominus button to decrease.

2. 100KHz THUMBWHEEL SWITCH

Sets 100KHz digit of the desired operating frequency.

3. 10KHz THUMBWHEEL SWITCH

Sets 10KHz digit of the desired operating frequency.

NOTE: IC-24G indicates the operating channel number with ② and ③ thumbwheel switches.
(Refer to page 18.)

